Program 6 : Education Tool of Emergency Response System for Disasters in Chemical Industrial Park

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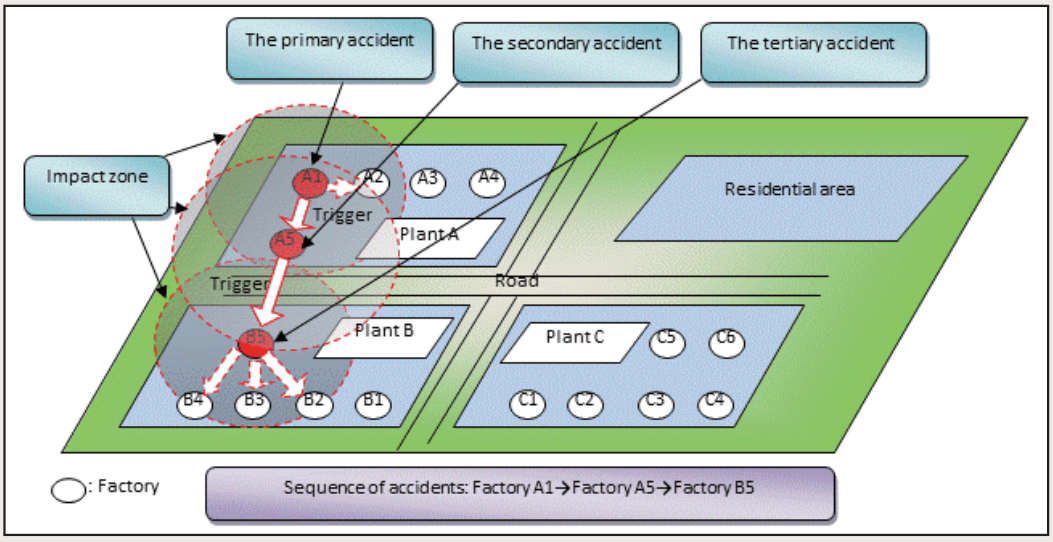
PROGRAM 6

Education Tool of Emergency Response System for Disasters in Chemical Industrial Park

Proposer Informartion		**Weili Duan** Affiliation: Ph.D. Candidate, Department of Civil and Earth Resources Engineering, Graduate School of Engineering, Kyoto University Brief Career: 2012-Present, Ph.D. Candidate, Kyoto University
Aims of Education/training		Knowledge, Interest, Desire, Actions
Target User	Type	Self learning, Education/training
	Direct user	Community leaders, Government staff, Organization/Company, Citizen
	Trainee/ Indirect User	Students(College/University), Organization staff/Officer, Local regidents, Citizen
Focus of this Information		Process Technology (PT)
Hazards		Multi-hazard (Multi-hazard approach), Others (Explain using the blank space below. Other hazards, disaster chains, etc.)
Type of Education/training		Lecture, Training Camp
Media/Material		Articles, Pamphlet, Photos
References		DRH Proposal, ID 49, ID 28, ID 51 Duan W, Chen G, Ye Q, Chen Q, 2011. The situation of hazardous chemical accidents in China between 2000 and 2006. Journal of hazardous materials 186, 1489-1494. (SCI=4.14) http://www.gnao.com.cn/news_detail.php?newsid=168&classid=3 http://www.gddjjt.com/newsdetail.asp?id=147 http://www.99people.com/newsite/park-news-cid-70089-lid-492



Education Tool on Emergency Response System for Disasters in Chemical Industrial Parks

Objectives:

1. To establish a sound, comprehensive ERS Education Tool to prevent secondary accidents and minimize losses in CIPs.
2. To improve people' s understanding of incidents that may happen in a Chemical Industrial Park, which is a special kind of community.
3. To enhance people' s ability to cope with chemical incidents through education using this tool.

Target user (type): Self learning, Education/training
Direct user: Community leaders, Government staff, Citizens, Organization/Company
Trainee/Indirect User: Local residents, Citizens, Organization staff/officer
Referred DRH Proposal: DRH49, DRH28, DRH51

1. Motivation

During recent years, accompanied with the high speed development of petroleum and chemical industry in the whole world, chemical industrial parks (CIPs) are today perceived as an integral part of development strategies of many countries worldwide. However, CIPs are high risk areas with many chemical plants gathered here. Because of the domino effect, once an accident occurs in CIPs, it may lead to other grave accidents and casualties.

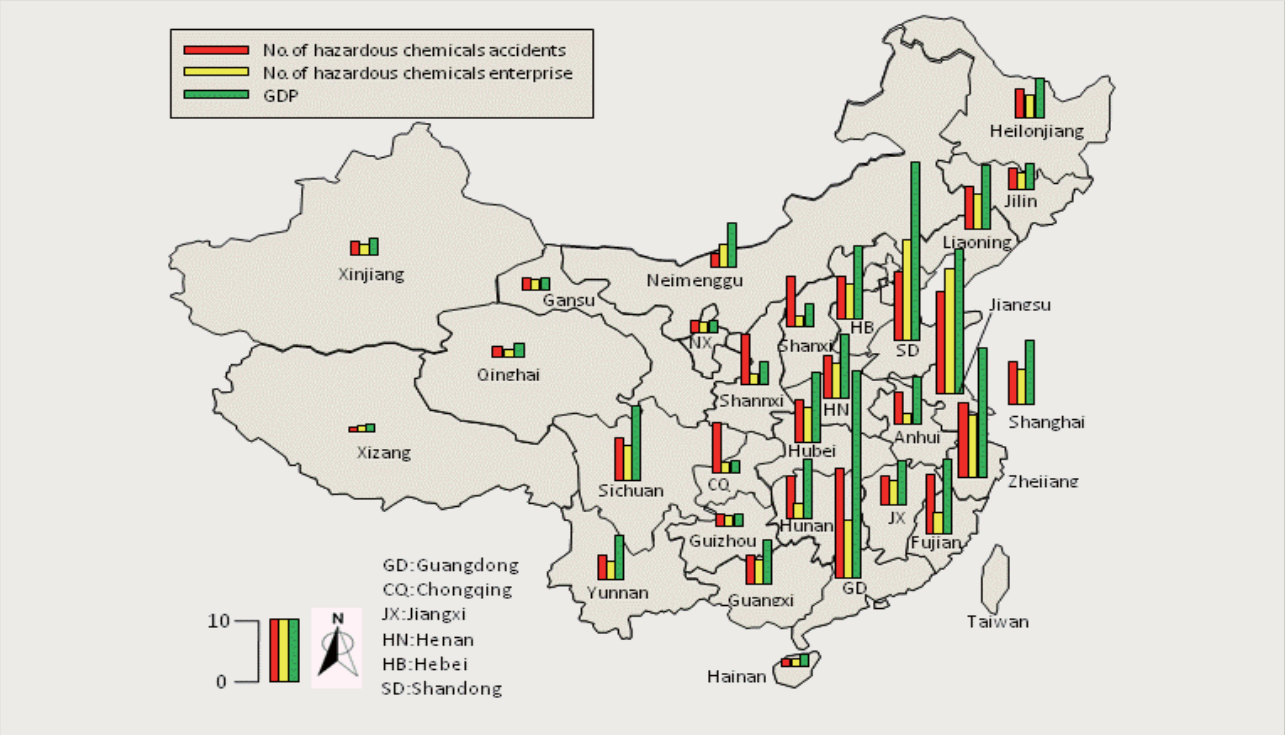


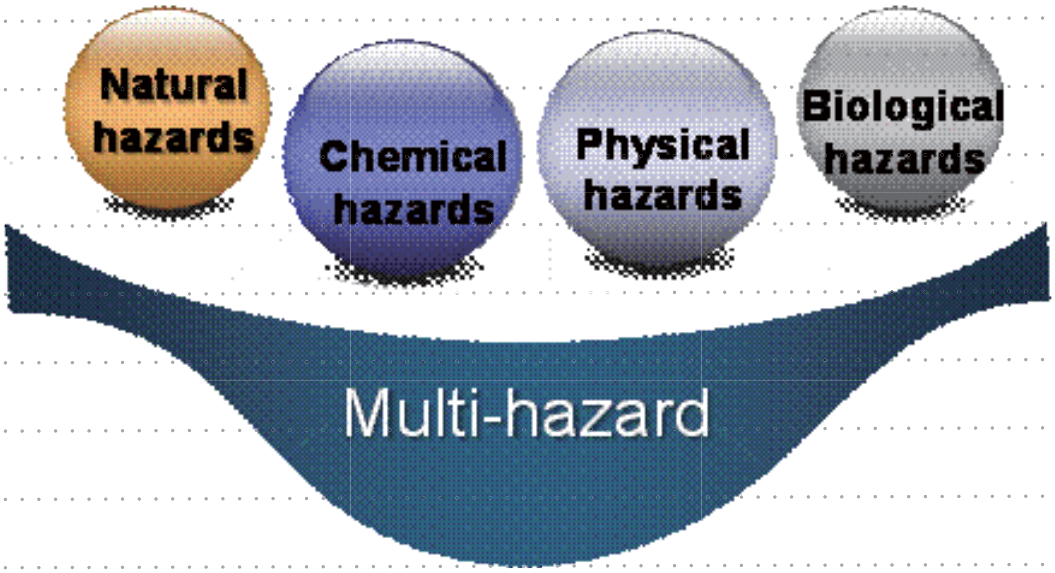
Fig.1 Sketch map of locations involved in the present study and spatial distribution of dangerous chemical accidents in China during 2005–2008

Thus, when a chemical accident occurs in CIPs, effective emergency response is crucial for containing its impact to the smallest possible area around the accident site. Using scenario analysis, this report is to build an education tool on Emergency Response System for Disasters in Chemical Industrial Parks.

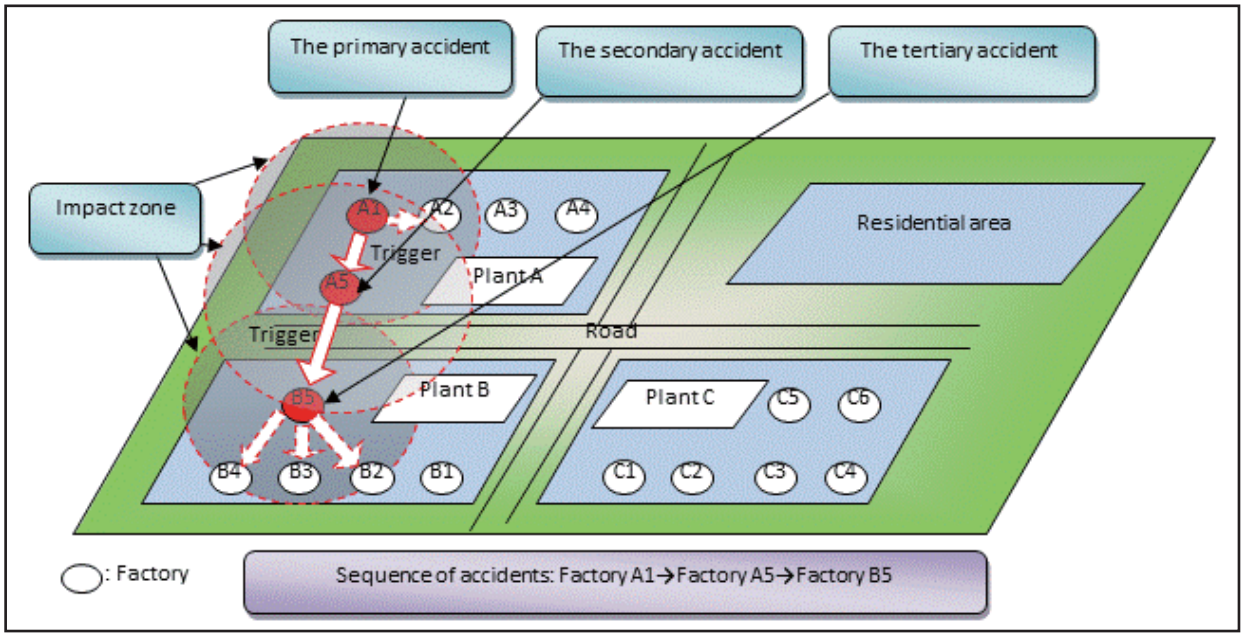
2. Development of ERS Education Tool

2.1. Hazard Identification

Natural hazards include anything that is caused by a natural process and can include obvious hazards such as volcanoes to smaller scale hazards such as loose rocks on a hillside. For example, earthquakes and typhoons will destroy chemical plants in CIPs. Physical hazards are the most common and will be present in most workplaces at one time or another. They include unsafe conditions that can cause injury, illness, and death. Biological hazards come from working with animals, people, or infectious plant materials. Work in day care, hospitals, hotel laundry and room cleaning, laboratories, veterinary offices, and nursing homes may expose you to biological hazards. Chemical hazards are present when a worker is exposed to any chemical preparation in the workplace in any form (solid, liquid, or gas). For example, hazardous materials are the main hazards in CIPs

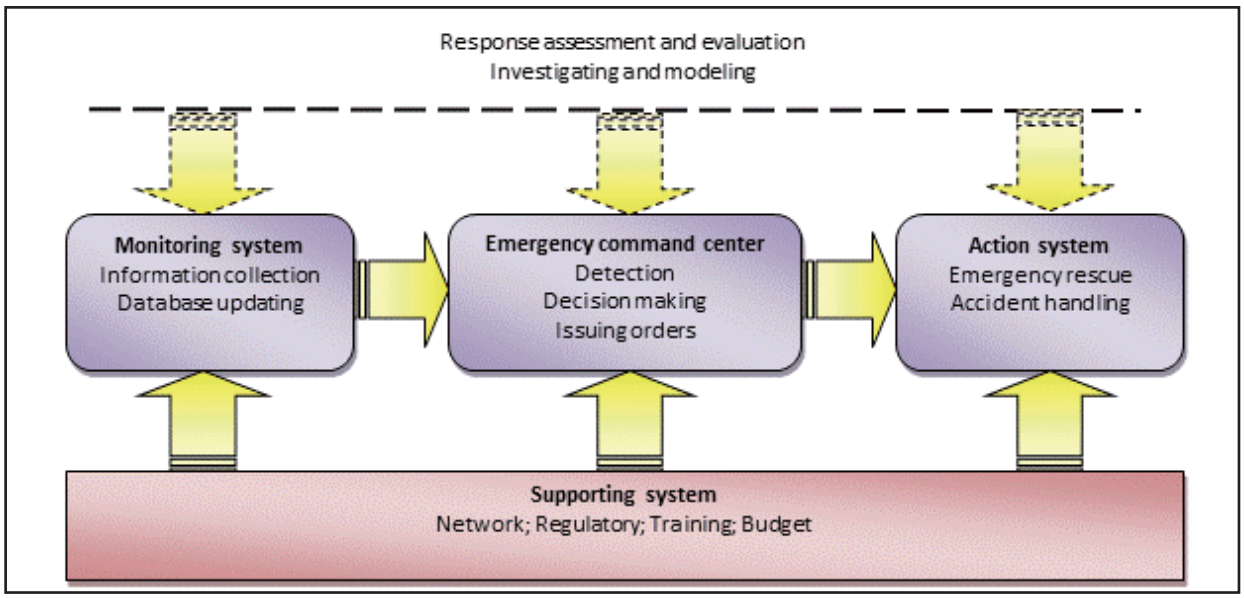


2.2. Scenario: Domino Accidents



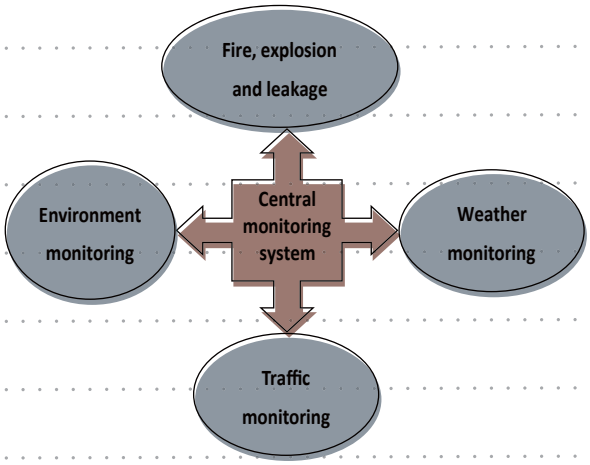
No.	The stage of emergency response	Signal	Emergency response actions
1	The first stage (plant level)	Yellow alert	The plant and its related department can control the accident by itself, even without further support from outside.
2	The second stage (CIP level)	Orange alert	Emergency staff of CIPs can be called on to control the accident.
3	The third stage (region level)	Red alert	As long as the accident needs other support from outside, the regional emergency response would be launched.

2.1. Hazard Identification



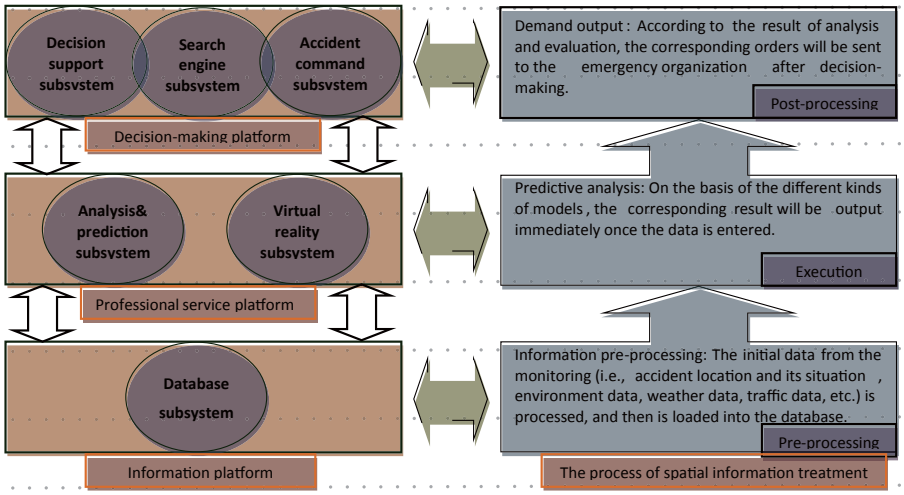
The ERS Education Tool in CIPs is composed of four parts: (1) a monitoring system, (2) an emergency command center, (3) an action system, and (4) a supporting system

2.4.1. Monitoring System



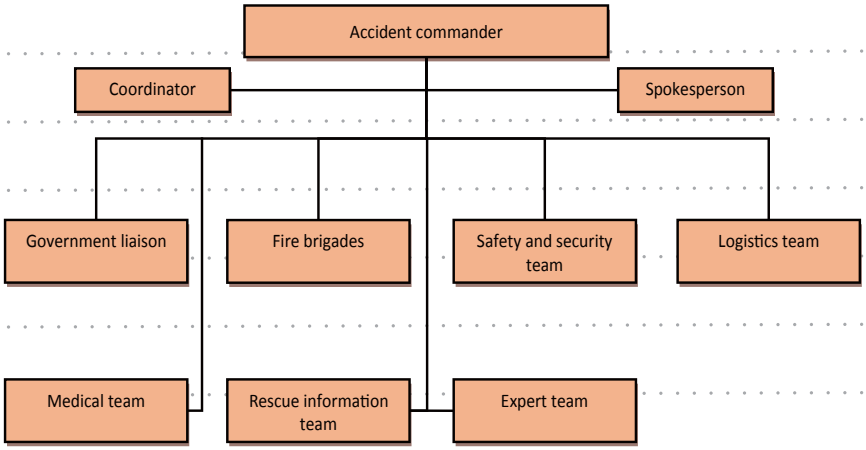
Functions of weather monitoring: Rainfalls or torrential rains are seriously considered and the data are renewed in the computer on a daily basis. The data of rainfalls are displayed on the screen in the weather monitoring subsystem, as well as wind speed, wind direction, stability conditions, cloud cover, temperature, and relative humidity.

2.4.2. Emergency Command Center



The emergency command center contains six subsystems and three application platforms: (1) the database subsystem supply data to the information platform, (2) the analysis and prediction subsystem and the virtual reality subsystem serve the professional service platform, and (3) the decision support subsystem, the search engine subsystem, and accident command subsystem offer services to the decision-making platform

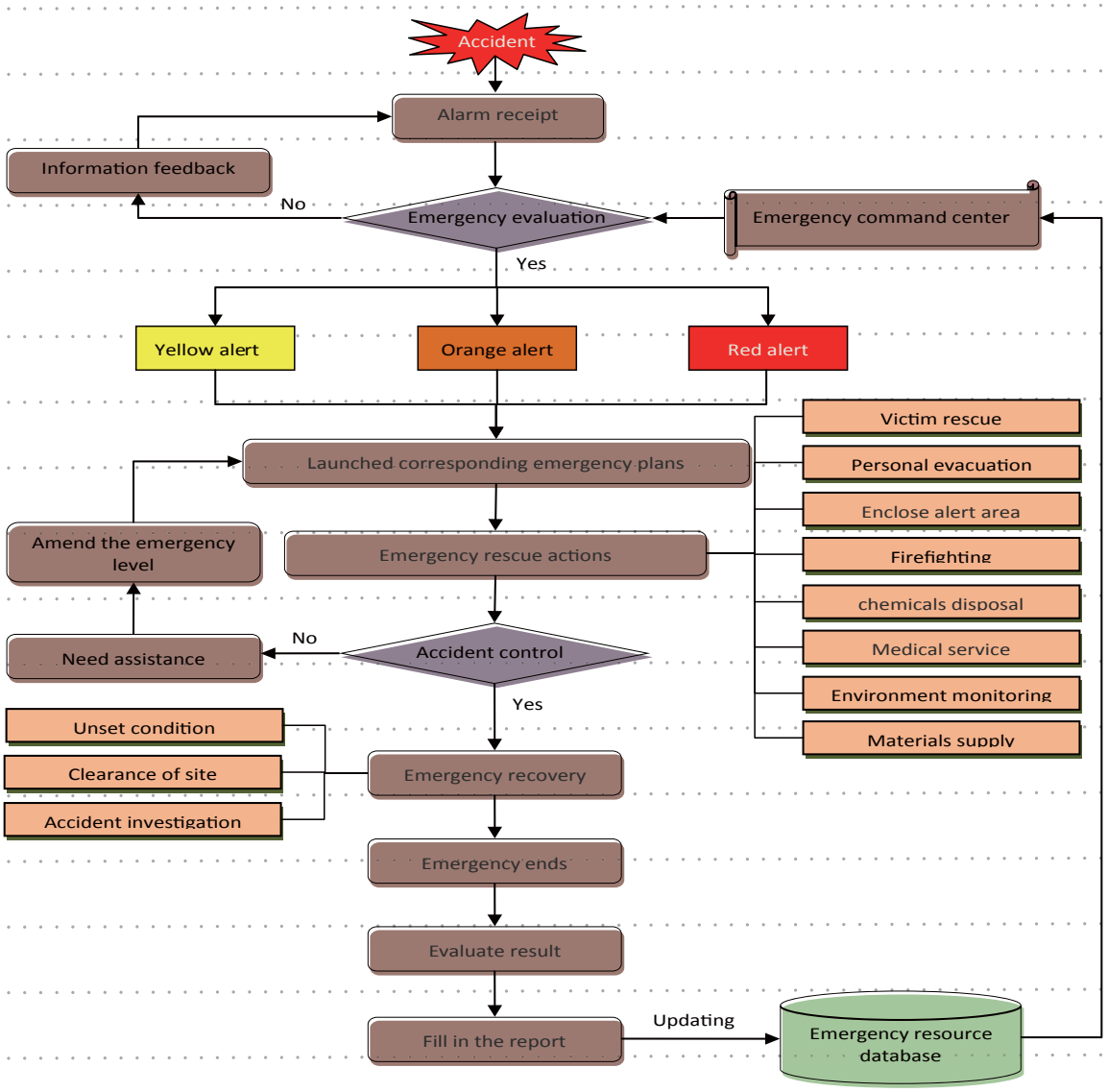
2.4.3. Teaching to Realize Different Duties



No.	Emergency rescue organization	Work assignment
1	Accident commande	• Activating elements of the emergency response system • Executing and planning the emergency response actions • Initiating the evacuation order to the staff • Assigning manpower resources • Approving requests for additional resources and requests for the release of resources
2	Coordinator	• Coordinating the rescue team and offering the response measures • Monitoring the incident operations to identify what might be potential inter-organizational problems • Bridging between the incident commander and rescue team for assisting to dispatch each task • Coordinating the task on
3	Spokesperson	• Issuing and explaining the incident information • Explaining the status of the emergency response process • Setting up and participating in a press conference
4	Government liaison	• Contacting and reporting information to related governmental agencies • Contacting the department of emergency command center to request safety and health equipment for other departments to use to control the upset situation
5	Fire brigades	• Rescuing people in danger • Controlling fires
6	Safety and security team	• Guiding and evacuating the staff and vehicles • Safely guiding the support-personnel into the plant • Evacuating visitor and onlookers to a safe location • closing off the scene of the acciden
7	Medical team	• Providing first aid and transporting the injured to a hospital • Arranging for medical supplies • Alerting the nearby hospital of potential patients
8	Rescue information team	• Providing and checking out the safety and health equipment • Recording rescue information • Assisting the incident analysis • Environmental and weather analysis
9	Expert team	• Participating in the development of an incident action plan and review the general control objectives, including alternative strategies as requested • Collecting and transmitting records and logs to the documentation unit at the end of each operational period
10	Logistics team	• Providing logistical support of all kinds to field forces • Coordinating and processing requests for additional emergency resource

3. Steps to Cope With Disasters

Under the framework of the ERS, the implementation of the emergency response is a complicated project. Here we can conclude that the basic emergency procedures of three different levels are the same excepting different sizes. Six main steps are used to carry out the emergency rescue process.



4. Safety Training (Education Method)

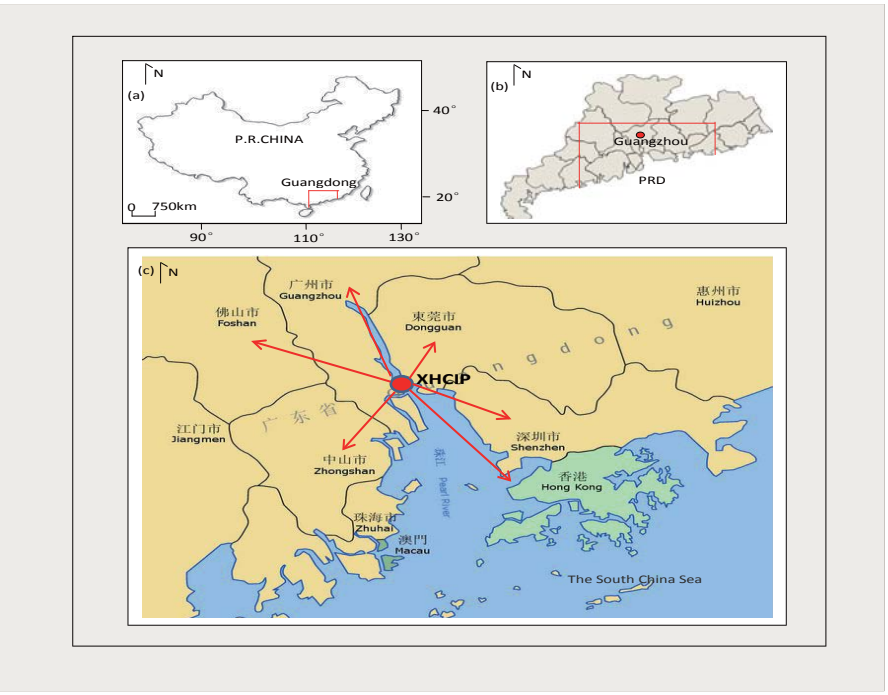
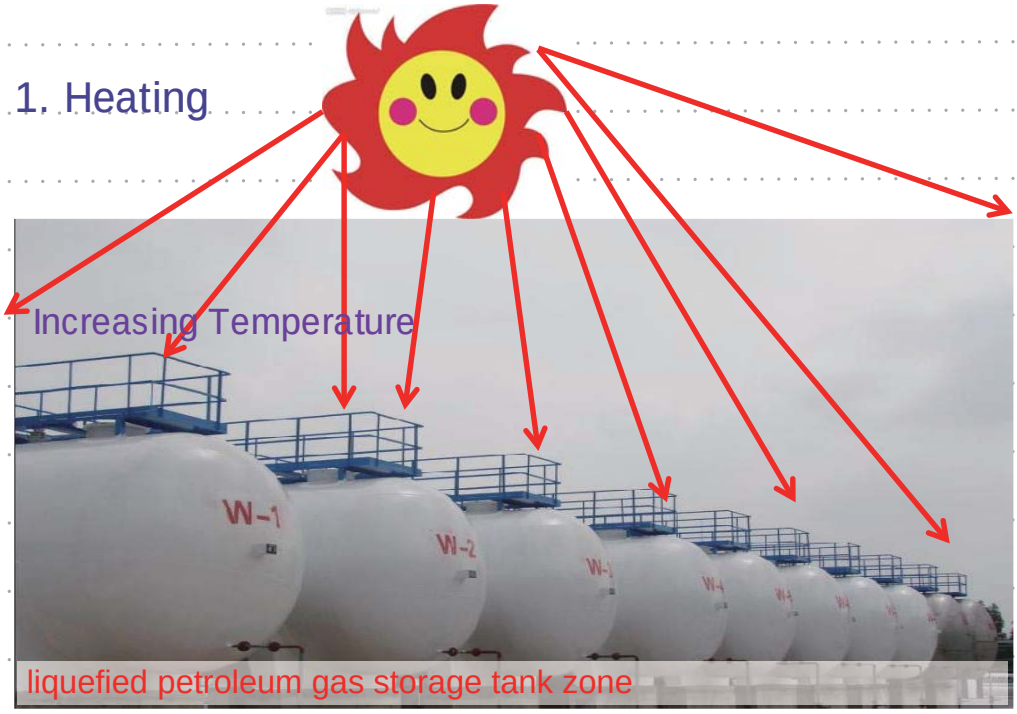


Fig.10 Schematic showing the geographical locality of (a) the Guangdong Province in China; (b) Guangzhou city in the Guangdong Province and Pearl River Delta (PRD) region; and (c) the XiaoHu Chemical Industrial Park (XHCIP) in Guangzhou Province



Alarm

3. Alarm receipt

4. Emergency evaluation & preparation

5.Cooling the tanks

8.Water monitoring

6.Cooling the tanks

7.Put out a fire

9. Atmosphere monitoring

10. Emergency command center

5. Conclusions

1. Reduce the emergency response time of accidents. For example, the time of alarm receipt was shortened within 2 minutes or so.
2. Raise the efficiency and accuracy of emergency rescue actions. The use of this education tool proved to be an effective tool for emergency management, e.g., real-time data collection, estimation of impacted area, determination of the candidate evacuation routes, and for helping the decision makers to visualize the modeling results.
3. Improving the ability of coping with the disasters that happen in chemical industrial parks, such as fire, explosion, and leakage.

References

1. DRH ID 49, ID 28, ID 51
2. Duan W, Chen G, Ye Q, Chen Q, 2011. The situation of hazardous chemical accidents in China between 2000 and 2006. Journal of hazardous materials 186, 1489-1494. (SCI=4.14)
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